

WHAT IS CLAIMED IS:

1. A method of fast frequency hopping CDMA coding of optical signals for transmission over an optical network, said method comprising the steps of:

- 5 a) providing a fast frequency hopping CDMA coded optical signal comprising a plurality of user's bits of a plurality of users;
- b) over spreading in a time axis each of said user's bits of said fast frequency hopping CDMA coded optical signal;
- c) interleaving each of said user's bits of a given user with a successive user's bit of said given user;
- 10 d) after steps a), b) and c), transmitting said fast frequency hopping CDMA coded optical signal over the optical network;
- e) after step d), over de-spreading in the time axis each of said user's bits of said fast frequency hopping CDMA coded optical signal; and
- 15 f) de-interleaving each of said user's bits of said fast frequency hopping CDMA coded optical signal from said successive user's bit.

20 2. The method of fast frequency hopping CDMA coding of optical signals according to claim 1, wherein said step b) is performed prior to said step c).

3. The method of fast frequency hopping CDMA coding of optical signals according to claim 1, wherein said step c) is performed prior to said step b).

25 4. The method of fast frequency hopping CDMA coding of optical signals according to claim 1, wherein each of said steps b) and c) are simultaneously performed.

5. The method of fast frequency hopping CDMA coding of optical signals according to claim 1, wherein said step e) is performed prior to said step f).
 6. The method of fast frequency hopping CDMA coding of optical signals according to claim 1, wherein said step f) is performed prior to said step e).
 7. The method of fast frequency hopping CDMA coding of optical signals according to claim 1, wherein each of said steps e) and f) are simultaneously performed.
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8. The method of fast frequency hopping CDMA coding of optical signals according to claim 1, wherein said step b) is simultaneously performed with a coding and a spreading operations providing the fast frequency hopping CDMA coded optical signal.
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9. The method of fast frequency hopping CDMA coding of optical signals according to claim 8, wherein said step c) is simultaneously performed with said step b).
- 20 10. The method of fast frequency hopping CDMA coding of optical signals according to claim 1, wherein said fast frequency hopping CDMA coded optical signal is encoded with an encoding means comprising an incoherent broadband source.
- 25 11. The method of fast frequency hopping CDMA coding of optical signals according to claim 1, wherein said fast frequency hopping CDMA coded optical signal is encoded with an encoding means comprising a coherent broadband source.

12. The method of fast frequency hopping CDMA coding of optical signals according to claim 11, wherein said step b) comprises the sub-step of phase coding said fast frequency hopping CDMA coded optical signal.
- 5 13. The method of fast frequency hopping CDMA coding of optical signals according to claim 12, wherein said step e) of over de-spreading comprises the sub-step of phase decoding said fast frequency hopping CDMA coded optical signal.
- 10 14. The method of fast frequency hopping CDMA coding of optical signals according to claim 1, wherein said optical network is fiber optic based.
- 15 15. The method of fast frequency hopping CDMA coding of optical signals according to claim 1, wherein said optical network is a fiber optic metropolitan access network.
16. The method of fast frequency hopping CDMA coding of optical signals according to claim 1, wherein a plurality of user's bits are interleaved before transmission.
- 20 17. A transmitter for transmitting over an optical network a fast frequency hopping CDMA coded optical signal comprising a plurality of user's bits of a plurality of users, each of said user's bits comprising a predetermined number of chips, said transmitter comprising an encoding means for over spreading in a time axis each of said user's bits of said fast frequency hopping CDMA coded optical signal and interleaving each of said user's bits of a given user with a successive user's bit of said given user.
- 25 18. The transmitter according to claim 17, wherein said encoding means comprises a plurality of filtering devices, each inserting a time spacing between two successive chips of a user's bit.
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19. The transmitter according to claim 18, wherein each of said filtering devices comprises a band reflective filter.
- 5 20. The transmitter according to claim 18, wherein each of said filtering devices comprises a frequency selective mirror.
21. The transmitter according to claim 20, wherein said frequency selective mirrors are serialized in an optical link.
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22. The transmitter according to claim 21, wherein said optical link comprises a plurality of time delay lines, each of said time delay lines extending between two adjacent frequency selective mirrors.
- 15 23. The transmitter according to claim 18, wherein each of said filtering devices are serialized in an optical link, each of said filtering devices comprising an input for receiving a broadband signal and a first and a second output, said first output selecting a specific wavelength of said broadband signal for outputting through a optical time delay line.
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24. The transmitter according to claim 18, wherein each of said filtering devices comprises a Bragg grating of a predetermined length, each of said gratings being serialized in an optical link.
- 25 25. The transmitter according to claim 24, wherein said optical link comprises a plurality of time delay lines, each of said time delay lines extending between two adjacent gratings.
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26. The transmitter according to claim 25, wherein each of said time delay lines has an identical length.

27. An optical communication system for exchanging over an optical network a fast frequency hopping CDMA coded optical signal comprising a plurality of user's bits of a plurality of users, said optical communication system comprising:

- 5 - a transmitter comprising an encoding means for over spreading in a time axis each of said user's bits of said fast frequency hopping CDMA coded optical signal and interleaving each of said user's bits of a given user with a successive user's bit of said given user; and
- a receiver comprising a decoding means for over de-spreading in a time axis each of said user's bits of said fast frequency hopping CDMA coded optical signal and de-interleaving each of said user's bits of a given user from the successive user's bit of said given user.